

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl toward the image carrier.

Claim 2 (Original): The cleaning device according to claim 1, wherein

the blade member has a length, and

the blade member is situated such that length of the blade member is parallel to an axis of rotation of the image carrier and the blade member makes an acute angle with a tangent to the surface of the image carrier in a direction of rotation of the image carrier.

Claim 3 (Original): The cleaning device according to claim 1, wherein the angle is between 0 degree and 50 degrees.

Claim 4 (Original): The cleaning device according to claim 1, wherein the vibratable member presses the blade member against the image carrier.

Claim 5 (Original): The cleaning device according to claim 1, further comprising a force imparting unit that imparts pressing force to the vibratable member to thereby press the end of the blade member against the image carrier.

Claim 6 (Original): The cleaning device according to claim 1, wherein the vibrating unit is a piezoelectric element.

Claim 7 (Original): The cleaning device according to claim 6, wherein the piezoelectric element is plate-like and fixed to the vibratable member.

Claim 8 (Original): The cleaning device according to claim 7, wherein the piezoelectric element expands and contracts to thereby vibrate the vibratable member.

Claim 9 (Original): The cleaning device according to claim 7, wherein the piezoelectric element has an electrode, and the electrode is electrically connected to the vibratable member.

Claim 10 (Original): The cleaning device according to claim 6, wherein the vibratable member has a fixed end and a free end, and the piezoelectric element is fixed to the vibratable member between the fixed end and the free end.

Claim 11 (Original): The cleaning device according to claim 6, wherein the piezoelectric element is a laminated type piezoelectric element that displaces the vibratable member in a laminating direction as d-33 direction.

Claim 12 (Original): The cleaning device according to claim 6, wherein the piezoelectric element is a laminated type piezoelectric element that displaces the vibratable

member in a face direction as d-31 direction, wherein the face direction is a direction perpendicular to the laminating direction.

Claim 13 (Original): The cleaning device according to claim 1, wherein the vibrating unit is fixed to the vibratable member, and the vibratable member is stiffer in a portion where the blade member is fixed than in a portion where the vibrating unit is fixed.

Claim 14 (Original): The cleaning device according to claim 1, wherein the vibrating unit is fixed to the vibratable member, the vibratable member is stiffer than the blade member, and a distance between the end of the blade member and an end of the blade member is between one to two times a thickness of the blade member.

Claim 15 (Original): The cleaning device according to claim 1, wherein the vibrating unit is fixed to the vibratable member, the vibratable member is stiffer than the blade member, the vibratable member having an end, wherein the end of the blade member and the end of the vibratable member are at same level or the end of the blade member protrudes towards the image carrier than the end of the vibratable member.

Claim 16 (Original): The cleaning device according to claim 1, wherein a plurality of the vibrating units are arranged at predetermined interval along a width of the vibratable member.

Claim 17 (Original): The cleaning device according to claim 16, further comprising a drive circuit that drives the vibrating units.

Claims 18-52 (Canceled).

Claim 53 (Currently Amended): A process cartridge comprising:

an image carrier that carries a toner image made of toner;

and

a cleaning unit having

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl toward the image carrier.

Claims 54-55 (Canceled).

Claim 56 (Currently Amended): An image forming apparatus comprising:

an image carrier that carries a toner image made of toner; and

a cleaning unit having

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl toward the image carrier.

Claims 57-58 (Canceled).

Claim 59 (Currently Amended): An image forming apparatus comprising a plurality of process cartridges, each process cartridge including

an image carrier that carries a toner image made of toner;

a charging unit that electrically charges the image carrier;

a developing unit that develops the toner images on the image carries;

a transfer unit that transfers the developed toner image onto a recording medium; and

a cleaning unit having

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl toward the image carrier.

Claims 60-61 (Canceled).

Claim 62 (Currently Amended): An image forming apparatus, in which a latent image is formed on an image carrier, the latent image is developed with a toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer (FPIA), the toner image is transferred onto a recording medium, the image forming apparatus comprising:

a blade member having an end, wherein the end touches a surface of the image carrier;

a vibratable member to which the blade member is fixed; and

a vibrating unit that, after the toner image is transferred onto the recording medium, vibrates the vibratable member so that the end of the blade member vibrates to thereby clean

toner remaining on the image carrier and so that the blade does not curl toward the image carrier.

Claim 63 (Original): The image forming apparatus according to claim 62, wherein the toner is produced by a polymerization method.

Claim 64 (Original): The image forming apparatus according to claim 62, wherein the end of the blade member is formed with a material having less affinity for the toner than other portion of the blade member.

Claim 65 (Original): The image forming apparatus according to claim 62, wherein an external additive is added to the toner, and the first end of the blade member is formed with a material having less affinity for the external additive than other portion of the blade member.

Claim 66 (Original): The image forming apparatus according to claim 62, wherein amplitude of vibrations of the end of the blade member is smaller than an average particle size of the toner.

Claim 67 (Original): The image forming apparatus according to claim 62, wherein amplitude of vibrations of the end of the blade member can be set as desired.

Claim 68 (Original): The image forming apparatus according to claim 67, further comprising an amplitude controlling unit that electrically controls the amplitude of vibrations of the end of the blade member.

Claim 69 (Original): The image forming apparatus according to claim 62, wherein the vibrating unit is a piezoelectric element.

Claim 70 (Original): The image forming apparatus according to claim 69, further comprising a voltage applying unit that applies an alternating voltage to the piezoelectric element.

Claim 71 (Original): The image forming apparatus according to claim 62, further comprising an amplitude controlling unit that changes amplitude of vibrations of the end of the blade member when the toner image is being formed and when toner image is not being formed.

Claim 72 (Original): The image forming apparatus according to claim 62, further comprising an amplitude controlling unit that changes amplitude of vibrations of the end of the blade member based on at least one of an amount of toner deposited on the image carrier, number of images formed, environmental conditions, and an amount of toner replenished.

Claim 73 (Currently Amended): A cleaning device comprising:  
a blade member having an end, wherein the end touches a surface of ~~[[a]]~~ an image carrier that carries a toner image made of toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer;  
a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member vibrates to thereby clean the toner on the image carrier and so that the blade does not curl toward the image carrier.

Claim 74 (Original): The cleaning device according to claim 73, wherein the toner is produced by a polymerization method.

Claim 75 (Original): The cleaning device according to claim 73, wherein the end of the blade member is formed with a material having less affinity for the toner than other portion of the blade member.

Claim 76 (Original): The cleaning device according to claim 73, wherein an external additive is added to the toner, and the end of the blade member is formed with a material having less affinity for the external additive than other portion of the blade member.

Claim 77 (Original): The cleaning device according to claim 73, wherein amplitude of vibrations of the end of the blade member is smaller than an average particle size of the toner.

Claim 78 (Original): The cleaning device according to claim 74, wherein amplitude of vibrations of the end of the blade member can be set as desired.

Claim 79 (Original): The cleaning device according to claim 75, wherein amplitude of vibrations of the end of the blade member can be set as desired.



Claim 80 (Original): The cleaning device according to claim 76, wherein amplitude of vibrations of the end of the blade member can be set as desired.

Claim 81 (Original): The cleaning device according to claim 77, wherein amplitude of vibrations of the end of the blade member can be set as desired.

Claim 82 (Original): The cleaning device according to claim 78, further comprising an amplitude controlling unit that electrically controls the amplitude of vibrations of the end of the blade member.

Claim 83 (Original): The cleaning device according to claim 79, further comprising an amplitude controlling unit that electrically controls the amplitude of vibrations of the end of the blade member.

Claim 84 (Original): The cleaning device according to claim 80, further comprising an amplitude controlling unit that electrically controls the amplitude of vibrations of the end of the blade member.

Claim 85 (Original): The cleaning device according to claim 81, further comprising an amplitude controlling unit that electrically controls the amplitude of vibrations of the end of the blade member.

Claim 86 (Original): The cleaning device according to claim 73, wherein the vibrating unit is a piezoelectric element.

Claim 87 (Original): The cleaning device according to claim 86, further comprising a voltage applying unit that applies an alternating voltage to the piezoelectric element.

Claim 88 (Currently Amended): A process cartridge comprising:

an image carrier that carries a toner image made of toner;

and

a cleaning unit having

a blade member having an end, wherein the end touches a surface of a an image carrier that carries a toner image made of toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member vibrates to thereby clean the toner on the image carrier and so that the blade does not curl toward the image carrier.

Claim 89 (Currently Amended): An image forming apparatus comprising a plurality of process cartridges, each process cartridge including

an image carrier that carries a toner image made of toner;

a charging unit that electrically charges the image carrier;

a developing unit that develops the toner images on the image carrier;

a transfer unit that transfers the developed toner image onto a recording medium; and

a cleaning unit having

a blade member having an end, wherein the end touches a surface of a an image carrier that carries a toner image made of toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member vibrates to thereby clean the toner on the image carrier and so that the blade does not curl toward the image carrier.

Claims 90-115 (Canceled).

Claim 116 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl,

wherein the vibrating unit is a piezoelectric element,

wherein the piezoelectric element is plate-like and fixed to the vibratable member,

wherein the piezoelectric element has an electrode, and the electrode is electrically connected to the vibratable member.

Claim 117 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl,  
wherein the vibrating unit is a piezoelectric element,  
wherein the vibratable member has a fixed end and a free end, and the piezoelectric element is fixed to the vibratable member between the fixed end and the free end.

Claim 118 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;  
a vibratable member to which the blade member is fixed; and  
a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl,  
wherein the vibrating unit is a piezoelectric element,  
wherein the piezoelectric element is a laminated type piezoelectric element that displaces the vibratable member in a laminating direction as d-33 direction.

Claim 119 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;  
a vibratable member to which the blade member is fixed; and  
a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl,

wherein the vibrating unit is fixed to the vibratable member, and the vibratable member is stiffer in a portion where the blade member is fixed than in a portion where the vibrating unit is fixed.

Claim 120 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl,

wherein the vibrating unit is fixed to the vibratable member, the vibratable member is stiffer than the blade member, and a distance between the end of the blade member and an end of the blade member is between one to two times a thickness of the blade member.

Claim 121 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl,

wherein the vibrating unit is fixed to the vibratable member, the vibratable member is stiffer than the blade member, the vibratable member having an end, wherein the end of the

blade member and the end of the vibratable member are at same level or the end of the blade member protrudes towards the image carrier than the end of the vibratable member.

Claim 122 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member does not curl,

wherein a plurality of the vibrating units are arranged at predetermined interval along a width of the vibratable member.

Claim 123 (New): The cleaning device according to claim 122, further comprising a drive circuit that drives the vibrating units.

Claim 124 (New): An image forming apparatus, in which a latent image is formed on an image carrier, the latent image is developed with a toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer (FPIA), the toner image is transferred onto a recording medium, the image forming apparatus comprising:

a blade member having an end, wherein the end touches a surface of the image carrier;

a vibratable member to which the blade member is fixed; and

a vibrating unit that, after the toner image is transferred onto the recording medium, vibrates the vibratable member so that the end of the blade member vibrates to thereby clean toner remaining on the image carrier and so that the blade does not curl,

wherein the end of the blade member is formed with a material having less affinity for the toner than other portion of the blade member.

Claim 125 (New): An image forming apparatus, in which a latent image is formed on an image carrier, the latent image is developed with a toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer (FPIA), the toner image is transferred onto a recording medium, the image forming apparatus comprising:

a blade member having an end, wherein the end touches a surface of the image carrier;

a vibratable member to which the blade member is fixed; and

a vibrating unit that, after the toner image is transferred onto the recording medium, vibrates the vibratable member so that the end of the blade member vibrates to thereby clean toner remaining on the image carrier and so that the blade does not curl,

wherein an external additive is added to the toner, and the first end of the blade member is formed with a material having less affinity for the external additive than other portion of the blade member.

Claim 126 (New): An image forming apparatus, in which a latent image is formed on an image carrier, the latent image is developed with a toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer (FPIA), the toner image is transferred onto a recording medium, the image forming apparatus comprising:

a blade member having an end, wherein the end touches a surface of the image carrier;

a vibratable member to which the blade member is fixed; and

a vibrating unit that, after the toner image is transferred onto the recording medium, vibrates the vibratable member so that the end of the blade member vibrates to thereby clean toner remaining on the image carrier

wherein amplitude of vibrations of the end of the blade member is smaller than an average particle size of the toner.

Claim 127 (New): An image forming apparatus, in which a latent image is formed on an image carrier, the latent image is developed with a toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer (FPIA), the toner image is transferred onto a recording medium, the image forming apparatus comprising:

a blade member having an end, wherein the end touches a surface of the image carrier;

a vibratable member to which the blade member is fixed ;

a vibrating unit that, after the toner image is transferred onto the recording medium, vibrates the vibratable member so that the end of the blade member vibrates to thereby clean toner remaining on the image carrier, wherein the vibrating unit is a piezoelectric element, and

a voltage applying unit that applies an alternating voltage to the piezoelectric element.

Claim 128 (New): An image forming apparatus, in which a latent image is formed on an image carrier, the latent image is developed with a toner having sphericity of 0.96 to



1.00 based on a flow type particle image analyzer (FPIA), the toner image is transferred onto a recording medium, the image forming apparatus comprising:

- a blade member having an end, wherein the end touches a surface of the image carrier;

- a vibratable member to which the blade member is fixed;

- a vibrating unit that, after the toner image is transferred onto the recording medium, vibrates the vibratable member so that the end of the blade member vibrates to thereby clean toner remaining on the image carrier, and

- an amplitude controlling unit that changes amplitude of vibrations of the end of the blade member when the toner image is being formed and when toner image is not being formed.

Claim 129 (New): A cleaning device comprising:

- a blade member having an end, wherein the end touches a surface of an image carrier that carries a toner image made of toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer;

- a vibratable member to which the blade member is fixed; and

- a vibrating unit that vibrates the vibratable member so that the end of the blade member vibrates to thereby clean the toner on the image carrier,

- wherein the end of the blade member is formed with a material having less affinity for the toner than other portion of the blade member.

Claim 130 (New): A cleaning device comprising:

a blade member having an end, wherein the end touches a surface of an image carrier that carries a toner image made of toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member vibrates to thereby clean the toner on the image carrier,

wherein an external additive is added to the toner, and the end of the blade member is formed with a material having less affinity for the external additive than other portion of the blade member.

Claim 131 (New): A cleaning device comprising:

a blade member having an end, wherein the end touches a surface of an image carrier that carries a toner image made of toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member so that the end of the blade member vibrates to thereby clean the toner on the image carrier,

wherein amplitude of vibrations of the end of the blade member is smaller than an average particle size of the toner.

Claim 132 (New): The cleaning device according to claim 129, wherein amplitude of vibrations of the end of the blade member can be set as desired.

Claim 133 (New): The cleaning device according to claim 130, wherein amplitude of vibrations of the end of the blade member can be set as desired.

Claim 134 (New): The cleaning device according to claim 131, wherein amplitude of vibrations of the end of the blade member can be set as desired.

Claim 135 (New): The cleaning device according to claim 132, further comprising an amplitude controlling unit that electrically controls the amplitude of vibrations of the end of the blade member.

Claim 136 (New): The cleaning device according to claim 133, further comprising an amplitude controlling unit that electrically controls the amplitude of vibrations of the end of the blade member.

Claim 137 (New): The cleaning device according to claim 134, further comprising an amplitude controlling unit that electrically controls the amplitude of vibrations of the end of the blade member.

Claim 138 (New): A cleaning device comprising:  
a blade member having an end, wherein the end touches a surface of an image carrier that carries a toner image made of toner having sphericity of 0.96 to 1.00 based on a flow type particle image analyzer;  
a vibratable member to which the blade member is fixed; and  
a vibrating unit that vibrates the vibratable member so that the end of the blade member vibrates to thereby clean the toner on the image carrier,  
wherein the vibrating unit is a piezoelectric element, and

further comprising a voltage applying unit that applies an alternating voltage to the piezoelectric element.

Claim 139 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member at a frequency of between 17 kilohertz and 50 kilohertz so that the end of the blade member does not curl.

Claim 140 (New): A cleaning device for cleaning toner from an image carrier that carries a toner image made of toner, comprising:

a blade member having an end, wherein the end touches a surface of the image carrier and scraps off toner from the surface;

a vibratable member to which the blade member is fixed; and

a vibrating unit that vibrates the vibratable member at a frequency of at least 1.5 kilohertz so that the end of the blade member does not curl.